

Working with spectrophotometry on sedimentary cores from estuaries of south Portugal

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The study of estuarine sediments to document Late Quaternary coastal changes had always been of extreme importance, as they reflect the combination of sea-level and sedimentary changes, either at a local, regional or global scale. In this sense, efforts have been made in order to develop new techniques that enable the acquirement of high-resolution sedimentary data. In this work, we applied sampling and analytical methods, from other research fields, in particular the solid state spectrophotometry that allows the acquisition of almost continuous sedimentary profiles at a low cost, and tried to validate its use in the study of estuarine sediment profiles. Accordingly, sediment cores were collected in 4 estuaries, and namely from west to east the estuary of Guadiana river, Almagem river, Arade river and Alvor river, all from the Algarve region. For each estuary, three cores were collected, each core having three centimeters of diameter and ca. three meters length. The color of the sediments was acquired every five centimeters, using the spectrophotometer Colortron™. Sediment core surfaces were digitised using the Scanner Mustek 1200 A3 PRO. Sediment samples were taken every twenty centimeters depth of the cores for major and minor elements analysis (ICP/MS), elemental analysis CNHS (Carlo Erba) and grain-size analysis (Malvern Mastersizer). Some samples were also taken whenever possible for ^{14}C dating (AMS), consisting mostly of shell fragments.

Based on all these parameters and samples, several main conclusions on the application of solid-state spectrophotometry to estuarine sediments can be drawn. First, there is a good reproducibility for the CIE Lab color data. CIE a and CIE b values are statistically similar for dry or wet sediment, but for CIE L there is a significant difference, with higher values for dry sediment. Secondly, when testing similarity between 2 cores based on the color data, we observe that 2 cores are never statistically equivalent, even for a minimal distance of 0,5 m between them. Thirdly, the use of Principal Components Analysis allowed confirming that the sediment color is influenced by the chemical composition of the sediment. Regarding the studied region, it seems that Fe and Si elements are the major determinants for characterising sedimentary units. Finally, the use of Factor Analysis was essential to i) interpret the great amount of variables, ii) observe sediment profile variability and iii) relate elemental sediment composition with color parameters. From a general point of view, the application of spectrophotometry for studying of estuarine sedimentary profiles seems promising in relation to several inherent advantages although there are still some limitations that should be taken into account for future studies of sediment color.

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ABSTRACT BOOK

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